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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/642,837	08/18/2003	Kohji Andoh	IR-2555 DIV	4071
2352	7590	09/21/2004	EXAMINER	
OSTROLENK FABER GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NY 100368403			THOMAS, TONIAE M	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/642,837

Applicant(s)

ANDOH ET AL.

Examiner

Toniae M. Thomas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 2 is/are rejected.
- 7) ☒ Claim(s) 3-5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 08/18/03.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

1. This action is a first Office action the merits of Application Serial No. 10/642,837, which is a divisional of co-pending Application Serial No. 10/115,757 filed on 02 April 2002, which claims benefit of provisional Application Serial No. 60/280,972 filed on 02 April 2001. Currently, claims 1-5 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. *Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 5,552,625) in view of Fuse et al. (US 5,466,612).*

The Murakami et al. patent (Murakami) discloses a method for forming a diode (figs. 1(a), 1(b), 2(a)-2(d) and accompanying text). The method comprises: the steps of forming a field oxide 4 atop a silicon die (fig. 2(a));ⁱ applying a mask to the surface of the field oxide and etching a window therein to clear a central area 11 for the application of an anode contact 2 (fig. 2(a) and col. 7, lines 35-37); diffusing impurity atoms through the window formed in the oxide to define a large area P/N junction 14 (fig. 2(a); col. 5, lines 18-22; and col. 7, lines 31-35); depositing metal atop the top surface of the die and to the top of the P/N

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junction and over an oxide termination ring, and applying a mask to the top surface and opening windows to etch the metal to define an anode contact 2 which overlies the inner periphery of the termination ring and a separate EQR ring (equipotential ring) 5 which overlies the outer periphery of the termination ring (figs. 1(b), 2(b); col. 5, lines 23-40; and col. 7, lines 36-42).ⁱⁱ

Murakami differs from the claimed invention in not teaching the limitations of: (1) applying a first mask to the top surface of the field oxide 4, etching a window in the center of the first mask, and diffusing the impurity atoms through the window, *as recited in claim 1*; or (2) evaporating platinum metal on the back surface of the die, and heating the die to drive platinum atoms into the die, *as recited in claim 1*.

The Fuse et al. patent (Fuse) discloses a method for forming a diode in a semiconductor device (figs. 1-3 and accompanying text). The method for forming the diode comprises applying a first mask 23 to the top surface of an oxide layer 22, etching a window in the center of the first mask, and diffusing impurity atoms 24 through the window (fig. 1 and col. 4, lines 48-61).

The Pike, Jr. et al. patent (Pike) discloses a method for forming a semiconductor device with platinum lifetime control (fig. 15 and col. 22, line 54 - col. 24, line 23). In one disclosed embodiment, platinum metal is evaporated on the back surface of a die (col. 22, line 64 - col. 23, line 1). The die is heated to drive platinum atoms into the die (col. 23, lines 14-28).

Since Murakami, Fuse, and Pike are from the same field of endeavor, the teachings for which Fuse and Pike are relied upon would have been recognized in the pertinent reference of Murakami by one of ordinary skill in the art at the time the invention was made.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Murakami in view of Fuse and Pike because: diffusing an impurity through a center window in a mask formed on the oxide layer, as described in Fuse, forms an impurity region that is self-aligned with respect to the mask; and heating the die to drive in platinum atoms after evaporating platinum metal on the back surface of the die, as described in Pike, provides control for minority carrier lifetimes (Pike - col. 4, lines 1-27).

While Murakami teaches that the remaining evaporated platinum has a thickness of about 10 Å and is driven into the die at a temperature of about 950°C (col. 22, line 64 - col. 23, line 1 and col. 23, lines 14-28), Murakami does not teach that the drive-in process occurs for about 30 minutes. However, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to drive the platinum atoms into the die for about 30 minutes, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering an optimum value of a result effective variable involves only routine skill in the art (*In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

Allowable Subject Matter

3. *Claims 3-5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.* Both claim 3 and claim 4 recite the limitations: depositing an amorphous silicon layer atop the die surface, and removing the deposited semi-insulating layer from atop the active P/N junction area and leaving it atop and in contact with the field plate and the EQR ring. While Murakami teaches depositing a semi-insulating layer 8 atop the die surface as shown in fig. 2(d), Murakami does not anticipate or teach, either explicitly or impliedly, removing the deposited semi-insulating layer from atop the active P/N junction area and leaving it atop and in contact with the field plate and the EQR ring, *as recited in claims 3 and 4*. There is no teaching or suggestion within the other prior art of record to modify Murakami by removing the deposited semi-insulating layer from atop the active P/N junction area and leaving it atop and in contact with the field plate and the EQR ring.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday-Thursday from 8:30 a.m. to 5:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Mary Wilczewski
Primary Examiner

MMJ

13 September 2004

ⁱ The insulating layer 4 is identified as a field oxide layer in the embodiment of figs. 4(a)-4(f). Whereas a LOCOS (local oxidation of silicon) method is used to form the field oxide layer 4 in the embodiment of figs. 4(a)-4(f), the field oxide layer 4 in the embodiment of figs. 2(a)-2(f) is most likely formed by a deposition method.

ⁱⁱ While Murakami does not explicitly teach that the metal contact 5 is an EQR ring, it is inherent that the contact is an EQR ring. An EQR ring is formed when a metal, such as aluminum, is deposited on a silicon oxide insulator (e.g. oxide layer 4), which overlies an implanted or diffused guard region (e.g. impurity region 16) formed in the substrate of the device.